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Research Article

CHARACTERISTICS OF CERVICAL LYMPH NODE INVOLVEMENT IN PAPILLARY THYROID CARCINOMA

[1,*]Emad Rezkallah, [2]Andrew Elsaify and [1]Wael Elsaify

[1]General Surgery Department, James Cook University Hospital, England
[2] Medical Schools, Misr University for Science and Technology, Egypt

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Abstract

Objectives: the aim of this study is to evaluate the relationship between the site of the primary papillary thyroid carcinoma and the level of cervical lymph node metastasis in order to help in future planning of dissection of the most accurate neck levels. **Methods**: retrospective review of patients with papillary thyroid carcinoma who underwent thyroidectomy either total or partial with neck dissection in our general surgery department during the period between 2011 and 2021. **Results:** 37 patients were included in our study according to the inclusion and exclusion criteria. The average age was 44± 19.5 years. Female to male ratio was 1.5:1. 20 patients were ≤ 45 years old (54%), while 17 patients were >45 years old (46%). The average maximum size of the tumors was 23.2± 17.9mm. 15 patients had multifocal disease (40.5%), while solitary lesions were found in 22 (59.5%). The incidences of lymph node metastasis according to the neck nodal level were 40.5% (15cases) at level □, 67.6% (25 cases) at level □, 45.9% (17cases) at level □, 16.2% (6 cases) at level □, and 54% (20 cases) at level □. 14 cases (37.8%) had T1 disease, 8 cases (21.6%) had T2 disease, and 15 cases (40.5%) had T3 disease. **Conclusion**: PTC most frequently metastasizes to level □ followed by level □. Level □ dissection is usually combined with dissection of level □. Most surgeons prefer to do prophylactic dissection of level □ even with no pre-operative evidence of involvement. Levels □ and □ are not routinely performed unless there is clinical/ radiological evidence of involvement.

Keywords: Papillary- Carcinoma- Lymph Node- Level- Metastasis.

INTRODUCTION

Thyroid carcinoma is considered the most common endocrine tumor and accounts for about 1% of all malignant tumors in humans. Papillary thyroid carcinoma (PTC) accounts for about 80-85% of all thyroid carcinoma[(1)].The incidence of thyroid carcinoma is increasing due to the recent advances in screening imaging and fine needle aspiration cytology [(2)].The overall survival for papillary carcinoma is good with estimated survival rate reaching about 90% over a 10-year of follow-up[(3)]. Special prognostic factors in PTC include patient's age, distant metastases, stage of disease, tumor size, histological grade, and extra-capsular extension. PTC has a tendency to occur in younger people with early lymph node metastases [(4)]. The frequency of cervical lymph node metastasis in PTC may range from 40- 90% [(1)]. Cervical lymph node metastasis is associated with an increased risk of recurrence in patients with PTC [(5)]. Generally, PTC metastasizes initially in the central compartment, then spread to the lateral compartment [(6)]; however, it is not the rule in all cases. Surgical management options for primary PTC include near-total thyroidectomy (leaving less than 1 g of thyroid tissue adjacent to the recurrent laryngeal nerve), and total thyroidectomy (removing all visible thyroid tissue) [(7)]. In general, near-total or total thyroidectomy is recommended for primary PTC ≥1.0 cm [(8)]. Although subtotal lobectomy and unilateral lobectomy have been performed in the past for the management of small PTC <1cm, recent studies did not support that [(8, 9)]. Therefore, the reasonable initial surgical management is essential to reduce the risk of recurrence and the complications of re-operation. In this study we analyzed the clinic-pathological data of 37 PTC patients who underwent thyroidectomy and neck dissection to illustrate the pattern of cervical lymph node metastasis in PTC to help in future planning of the best surgical management options.

***Corresponding Author: Emad Rezkallah,**
General Surgery Department, James Cook University Hospital, England

METHODS

We did retrospective review of patients who underwent either total or near total thyroidectomy with neck dissection for PTC in our general surgical department, during the period from 2011 to 2021. Inclusion criteria included 1- confirmed pathological diagnosis of PTC, 2- patient underwent thyroidectomy and neck dissection, and 3- age > 18years. Exclusion criteria included 1- other pathological types of thyroid cancer, 2- mixed histologic types of carcinoma, 3- PTC managed by thyroidectomy only with no lymph node dissection. Based on the inclusion and exclusion criteria, 37 patients were included in our study. Preoperative assessment included physical examination, thyroid function tests +/- thyroiditis assessment. Imaging studies included high resolution ultrasonography of the neck +/- staging CT scan/MRI. Ultrasonographic features of malignancy included: solid hypoechoic lesions, irregular margins, capsule discontinuities and/or micro-calcifications. For pathological evaluation, fine needle cytology aspiration (FNA) was utilized in case of indeterminate or suspicious lesions. Every individual case was discussed at an endocrine MDT meeting involving an endocrine surgeon, endocrinologist, anesthetist, radiologist and pathologist. Transverse collar incision was used in case of thyroidectomy and central neck dissection, while in case of lateral neck dissection Hockey stick incision was used. Seven patients had modified radical neck dissection with preservation of spinal accessory nerve, sternocleidomastoid muscle and internal jugular vein, while 30 patients had selective neck dissection. Nerve monitoring technology has been utilized for detection and preservation of the recurrent laryngeal nerve. Post-operative blood tests for the evaluation of PTH and calcium were performed on the day after surgery and at regular intervals for early detection and management of hypo-parathyroidism and hypocalcaemia. Lifelong TSH suppression using thyroxin treatment also was indicated postoperatively. Post-operative radioactive iodine was recommended to ablate any residual micro or macro-disease.

Figure 1: Pre-operative Neck CT showing (A) bilaterally enlarged cervical lymph nodes at levels □, □ and □, (B) multiple thyroid nodules with enlarged left cervical lymph node level □, (C) multiple pathological enlarged lymph nodes in the left cervical level III/IV; the largest one with central necrotic foci compressing the adjacent left jugular vein.

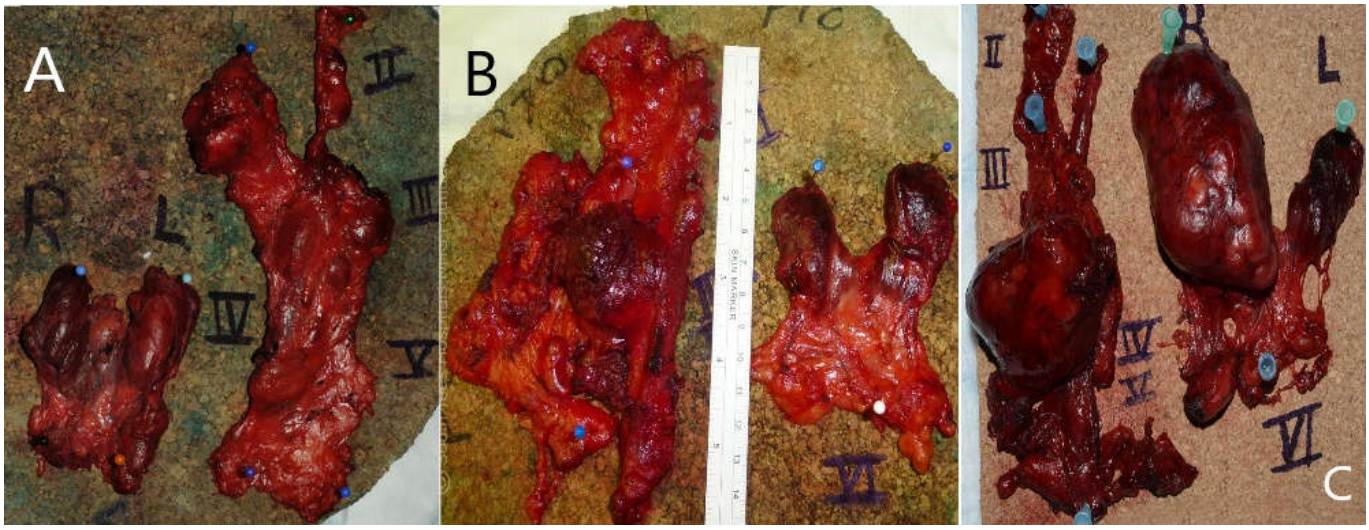

Figure 2: Total thyroidectomy and selective neck dissection (A) total thyroidectomy with central and left neck dissection (□, □ and □), (B) total thyroidectomy with central and right neck dissection (□, □ and □), (C) total thyroidectomy with central and right neck dissection (□, □ and □)

RESULTS

37 patients were included in our study. The average age of diagnosis was 44 ± 19.5 years. The youngest patient was 21 and the oldest was 84 years old. Female to male ratio was 1.5:1. 20 patients (54%) were ≤ 45 years old, while 17 patients (46%) were >45 years old. The average maximum size of the tumors was 23.2 ± 17.9mm. The largest tumor was 75mm while the smallest nodule was 1mm. Multifocal disease was found in15 cases (40.5%), while solitary lesions were found in 22 (59.5%). PTC has liability to spread to cervical lymph nodes but with different tendency (Figures 1, 2).The incidences of lymph node metastasis according to neck nodal level were 40.5% (15 cases) at level □, 67.6% (25 cases) at level □, 45.9% (17 cases) at level □, 16.2% (6 cases) at level □, 54% (20 cases) at level □, 16.2% (6 cases) at local peri-thyroidal tissues, while no metastasis was found at level □. The mean number of the dissected metastatic lymph nodes was 8.7±8.4 lymph nodes. 29 cases (78.4%) had metastatic disease at multiple levels, while 6 patients had single neck level metastasis; 5 of them had metastatic lymph nodes at level □ and one only had the positive lymph nodes at level □. Two patients had no metastatic lymph nodes; both of them had total thyroidectomy and selective level □ dissection.

On assessment of the tumor stage, we found that 14 cases (37.8%) had T1 disease, 8 cases (21.6%) had T2 disease, and 15 cases (40.5%) had T3 disease (Table 1).

Table 1. Demographics and clinical characteristics of patients who had neck dissection

Variable		Value
Age	Mean	44± 19.5 years
	Youngest	21
	Oldest	84
Gender	Males	15 (40.5%)
	Females	22 (59.5%)
Tumor size	Mean	23.2± 17.9mm.
	Smallest	1m
	Largest	75mm
Multifocality	Multifocal	15 (40.5%)
	Solitary lesion	22 (59.5%)
Levels involved	I	0
	II	15 (40.5%)
	III	25 (67.6%)
	IV	17 (45.9%)
	V	6 (16.2%)
	VI	20 (54%)
Tumor stage	I	14 (37.8%)
	II	8 (21.6%)
	III	15 (40.5%)
N of metastatic LNs	Mean	8.7±8.4 lymph nodes

DISCUSSION

Papillary thyroid carcinoma is considered the most common type of all differentiated thyroid malignancy. The average age of diagnosis in our study was 44± 19.5years of age. Female to male ratio was 1.5:1. PTC was confirmed as the fifth most common malignancy in women [10]. PTC has an early tendency for cervical lymph node metastasis .It is estimated that more than 60% of PTC has nodal metastasis by the time of diagnosis [11]. In this study, we found that the number of positive lymph nodes was higher in both young and elderly populations when compared to middle age group although there was no significant difference in survival relative to age [12]. Thus, the initial surgical management can strongly influence the disease-free and overall survival. We found that 78.4% of the patients had multiple-level nodal involvement with level being the most commonly involved (67.6%). Other studies had similar results [13, 14]. Level metastasis was found in 54% of the patients. However, in the study by Ducci et al, level VI nodal metastasis was reported as the most frequently involved level [15]. Level lymph node metastasis was not found in isolation and it was usually associated with metastasis in other levels, other studies had similar observations [13]. Level metastasis was extremely rare in accordance with other studies [16]. The incidence of multifocal disease affecting the same or both lobes was about 40.5%; other studies also confirmed concurrent presence of intra-thyroidal metastasis [17]. In the current study, lymph node metastasis was found in 35 patients (94.6%), while in 2 patients there was no definite lymph node metastasis; other studies reported high rates of lymph node metastasis up to 85% [18].

In the past, the standard surgical procedure in case of synchronous cervical lymphadenopathy was the modified radical nodal dissection at the time of thyroidectomy. The benefits of such technique included optimal local control of the disease, enhancing the efficacy of postoperative radioactive therapy, and facilitated patient monitoring on post-operative follow-up. Recently, the advances in imaging have allowed for accurate localization of the diseased lymph nodes in different neck compartments [19]. High-resolution ultrasonography has been used widely in pre-operative assessment of the diseased cervical lymph nodes with sensitivity and specificity reaching about 97% and 93%, respectively [20]. The accuracy of ultrasonography in the evaluation of the pathological lymph nodes in the lateral neck compartments is better than in the central neck compartment [21]. Ultrasonography guided FNAC has diagnostic sensitivity and specificity of about (95- 98% and 95- 97%, respectively) in assessment of the diseased cervical lymph nodes [11]. Indications for other imaging studies such as CT or MRI scans included extensive disease, evaluation for possible involvement of vital neck structures such as the trachea or esophagus, and to exclude distant metastasis. The ability to perform accurate pre-operative assessment of the disease extension allowed for the use of more selected dissection of the cervical lymph nodes. Selective neck dissection has proven to reduce the potential morbidity associated with more extensive procedures like modified neck dissection, without affecting the oncological outcomes [22]. Typical modified radical dissection involves dissection of all neck levels from I to VI; however, according to the pattern of lymphatic spread of PTC, routine level I dissection is not recommended [22]. In addition, other studies did not support level dissection when preoperative pathological lymph nodes were not present on high resolution imaging [16]. In our study, level metastasis was found only in 6 cases (16.2%). On the other hand, level VI is usually dissected, even as a prophylactic procedure due to the high frequency of microscopic metastases at this level [23]. Level VI nodal dissection is indicated when there is involvement of lateral neck compartment(s), even with ultrasonographically negative nodes [24]. In this study, level involvement was found in more than half of the cases (54%). In addition, 5 cases had metastatic disease at level only. Levels III and IV are commonly involved in PTC. Thus, dissection of these levels is usually performed in continuity even if the disease is present at only one of these levels [16]. In our study, level metastasis was found in 67.6% of the patients, while level metastasis was found in 45.9%. Level II dissection is recommended whenever there is extensive involvement of levels III/IV, even when there is no clinical or ultrasonographic pre-operative pathological involvement [16]. In our study, level metastasis was present in 40.5% of the cases. In addition, solitary level metastasis was found in one patient. There were no significant differences in the rate of recurrence between selective and modified radical dissection. While Welch et al. reported recurrence rates of (8%) post selective neck dissection [22]; other studies reported recurrence rates of (8–12%) following modified radical dissection [22, 25]. SLND provides targeted dissection of the involved neck compartments and avoids unnecessary extensive dissections with better cosmetic results. Major complications following total thyroidectomy and SLND included neuropathic symptoms due to injury to the neck nerves (i.e. greater auricular, transverse cervical, supraclavicular nerves of the cervical plexus, etc.), injury to the recurrent laryngeal nerves and voice changes, hypo-parathyroidism and hypocalcaemia, hypothyroidism, bleeding, injury of the internal jugular vein, and a rare incidence of chylous leakage. However, more studies are still required to compare the morbidity and oncological outcomes between modified radical neck dissection and selective neck dissection.

Conclusion

Papillary thyroid carcinoma (PTC) represents the most common endocrine malignancy with good overall survival. Selective neck dissection provides better cosmetic results and less morbidity compared to modified radical neck dissection. Levels and neck compartments represent the most frequent levels to be involved by metastasis from PTC. Level dissection is usually recommended by most surgeons even as a prophylactic procedure during the initial thyroidectomy. Level dissection is not usually recommended unless there is positive lymph node involvement on pre-operative evaluation. Level dissection is not performed routinely unless there is extensive disease involving levels /. Level dissection is not recommended as the incidence of disease involvement of level is very rare.

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